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10/570,903	03/07/2006	Michinari Miyagawa	KITO5.002APC	1649

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EXAMINER	
BARROW, AMANDA J	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/570,903	MIYAGAWA, MICHINARI	
	Examiner	Art Unit	
	AMANDA BARROW	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 November 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) *19-25* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Application

1. The Applicant's amendment filed on 11/10/2009 was received. Claim 1 was amended. Claims 19-25 have been restricted out and withdrawn by the Applicant.

2. The texts of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on 8/10/2009.

Claim Objections

3. Claims 16-18 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 16-18 recite every limitation recited in the independent claim.

Claim Rejections - 35 USC § 112

4. The claim rejection on 35 U.S.C. 112, second paragraph on claims 2-4, 11 and 15 are withdrawn because the independent claim from which they depend has been amended.

Claim Rejections - 35 USC § 102

5. The claim rejections under 35 U.S.C. 102(b) as being anticipated by Yoshida et al. (US Patent Application 2001/0005560 A1) on claims 1, 3, 14 and 16-18 are withdrawn. However,

upon further consideration, a new ground(s) of rejection is made in view of Baars et al. (US Patent Application 2004/0076863).

Claim Rejections - 35 USC § 103

6. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Yoshida, Ooma, Takano, Kitade, Takao and Yamashita on the remaining claims are withdrawn as the Applicant's arguments against the independent claim is persuasive. However, upon further consideration, a new ground(s) of rejection is made in view of Baars et al. (US Patent Application 2004/0076863).

7. Claims 1-11, 13, 14, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baars et al. (US Patent Application 2004/0076863).

Regarding claims 1, 2 and 3, Baars discloses a bipolar plate which includes a core 16 ("metal substrate"), a polymeric composite layer 12 ("first layer"), and an adhesion promoter ("third layer") disposed between and in intimate contact with the core and the composite (paragraphs 10, 26). An additional material 20 ("second layer") is disposed on top of the polymer composite layer 12 that is heat and electrically conductive that may be identical to polymeric composite 12 or may be a different material (paragraph 27). Baars discloses that the core 16 may be made of a metal (paragraph 37); the polymeric composite layer 12 ("first layer") comprises electrically conductive filler dispersed in a resin system (paragraph 72); the adhesion promoter ("third layer") may comprise conductive particles in an amount and of a type effective to reduce the volume resistivity of the component (paragraph 10) and resins (paragraph 38 and

58); and that the additional material layer 20 ("second layer") can be made of electrically conductive filler dispersed in a resin system that differs from the polymer composite layer 12 ("first layer") (paragraph 27, 72). Baars discloses that the conductive particular quantities will vary depending on the desired resistivity, the type and shape of the filler, the formulation of the adhesion promoter and similar considerations (paragraph 66) and that the overall volume resistivity of the bipolar plate is preferably less than 0.50 ohm-cm or less (paragraph 10). Thus, Baars discloses the same materials used for the substrate and the three layers as the Applicant's disclosure.

Therefore, it would have been obvious to a person of ordinary skill in the art to modify the amount of conductive filler in the three layers of Baars, namely the adhesion promoter, the polymeric composite layer 12 and the additional material layer 20, because Baars teaches that the conductive particular quantities will vary depending on the desired resistivity, the type and shape of the filler, the formulation of the adhesion promoter and similar considerations (paragraph 66). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Regarding claims 4 and 5, Baars teaches that the amount of conductive filler in the adhesion promoter layer ("third layer") is from 10-90 weight percent (paragraph 66) and that the amount of conductive filler in the polymer composite layer 12 ("first layer") is about 10% to 90% by volume (paragraph 88). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d.257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed.

Cir. 1990); *In re Geisler*, 116 F.3d 1465, 1469-71, 43 USPQ2d 1362, 1365-66 (Fed Circ. 1997). See MPEP 2144.05.

Furthermore, please see the rejection of claims 1-3 for the rejections of 4 and 5 because the rejection of claims 1-3 shows that the amount of conductive fillers in the three layers is a known-result effective variable.

Regarding claim 6, Baars discloses that the core material 16 ("substrate") may be metal and the useful metal cores comprise aluminum and stainless steel (paragraph 37).

Regarding claim 7, Baars discloses that metal substrate may be a gold-plated metal (paragraph 37).

Regarding claim 8, Baars discloses that the bipolar plate is made my first lightly abrading or etching the core 16 ("metal substrate") by a method such as buffing, scrubbing or grit blasting (paragraph 90); thus the core 16 ("metal substrate") has a roughened surface.

Regarding claim 9, Baars discloses that the conductive filler is selected from carbon materials, metal carbides, metal oxides, and metals (paragraph 64).

Regarding claim 10, Baars discloses that the conductive filler can be carbon black and carbon fibers (paragraph 64).

Regarding claim 11, Baars discloses that the conductive filler in any of the three layers may be fine carbon fiber and that preferably some or all of the filler is in the form of fibers (paragraph 64, 86 and 88).

Regarding claim 13, Baars discloses that the conductive filler in any of the three layers may be carbon black (paragraphs 64 and 86).

Regarding claim 14, Baars discloses that resin used in the three layers may be a fluororesin, flurorubber, polyolefin resin or a polyolefin elastomer as exemplified in the list of examples listed in paragraphs 38-63 and 74-84.

Regarding claims 16-18, Baars discloses a bipolar plate with all three layers, namely a polymeric composite layer 12 ("first layer"), and an adhesion promoter ("third layer") and an additional material layer 20 ("second layer") (paragraphs 10, 26 and 27).

8. Claims 12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baars et al. (US Patent Application 2004/0076863) as applied to claims 1-11, 13, 14, and 16-18, and further in view of Hinton (US Patent 6,103,413).

Regarding claim 12, Baars discloses that the fibers having a length to diameter ratio of about 400 to 10,000 are preferred (paragraph 88). As the claim recites that the fiber has a diameter of 0.001 to 0.5 μm and 1 to 100 μm, the aspect ratio would fall within the range taught by Baars. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d.257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Geisler*, 116 F.3d 1465, 1469-71, 43 USPQ2d 1362, 1365-66 (Fed Circ. 1997). See MPEP 2144.05.

Furthermore, Hinton discloses a similar invention in which a bipolar plate is made of a tri-layer composite in which each layer is made of resin and conductive particles. Hinton teaches that the conductive filler is preferably carbon fiber and that the aspect ratio is at least 5 and most preferably at least 100; however, the optimum aspect ratio of the fiber will depend on the mean

pore size of the porous electronically-conductive material, with longer fibers being more suitable for use with larger mean pore size materials (column 2, lines 53-59).

Therefore, it would have been obvious to a person of ordinary skill in the art to adjust the length and therefore the aspect ratio of the carbon fibers in the used as the conductive filler in the invention of Barrs because Hinton teaches that the optimum aspect ratio of the fiber will depend on the mean pore size of the porous electronically-conductive material, with longer fibers being more suitable for use with larger mean pore size materials (column 2, lines 53-59). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Regarding claim 15, Baars discloses that the adhesion promoter layer ("third layer") has a thickness of about 1 to about 100 μm, the polymeric composite layer 12 ("first layer") has a thickness of less than 1.3 millimeters (1300 μm) and most preferably less than 0.4 millimeters (400 μm). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d.257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Geisler*, 116 F.3d 1465, 1469-71, 43 USPQ2d 1362, 1365-66 (Fed Circ. 1997). See MPEP 2144.05.

Baars is silent as to the thickness of the additional material 20 ("second layer"); however, Hinton discloses a similar invention in which a bipolar plate is made of a tri-layer composite in which each layer is made of resin and conductive particles. Hinton discloses that the optimum thickness of the suitable electronically-conductive materials which include carbon-based composites and electronically conductive polymers will depend on the application as well as the

desired permeability and conductivity (column 1, line 66 through column 3, line 6).

Therefore, it would have been obvious to a person of ordinary skill in the art to modify the thickness of any of the layers in the bipolar plate of Baars because Hinton discloses that the optimum thickness will depend on the application as well as the desired permeability and conductivity (column 1, line 66 through column 3, line 6). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

9. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hinton (US Patent 6,103,413) in view of Baars et al. (US Patent Application 2004/0076863).

Regarding claims 1-5, Hinton discloses a bipolar separator plate that can be used in fuel cells (column 1, lines 5-14) having two layers of a porous electronically conductive material ("second and third resin layers") having positioned therebetween a solid layer of a polymeric material having a conductive filler dispersed therein ("first resin layer") (abstract). Hinton discloses that suitable electronically conductive materials (used for the "second and third resin layers") include carbon-based composites and solid, porous, electronically conductive polymers, among other materials (column 1, line 66 through column 2, line 4). Hinton discloses that the bipolar plate preferably has an area resistivity of less than 1 ohm-cm^2 (abstract). To calculate the volume resistance one would need the length of the bipolar plate used. Hilton discloses an example in which the length is 5.75 inches long (14.6 cm) which would give a volume resistance of 0.068 ohm-cm, thus the total volume resistance of all three layers is less than 1.0 ohm-cm.

Hilton fails to disclose the volume resistance of each layer; however, Hilton does disclose that the amount of the conductive filler in the polymeric materials of the three layers can be varied (column 2, lines 60-64). Baars discloses that the conductive particular quantities will vary depending on the desired resistivity, the type and shape of the filler, the formulation of the adhesion promoter and similar considerations (paragraph 66).

Therefore, it would have been obvious to a person of ordinary skill in the art to alter the amount of conductive filler used in the layers of Hinton in order to optimize resistivity because Baars teaches that the conductive particular quantities will vary depending on the desired resistivity, the type and shape of the filler, the formulation of the adhesion promoter and similar considerations (paragraph 66). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Furthermore regarding claims 1-5, Hinton fails to teach that the tri-layer separator is formed on one side of a metal substrate; however, Baars discloses a similar invention in which multiple polymer resin layers filled with conductive fillers are layered upon a metal substrate (paragraphs 10, 26, 27 and 37) to make a bipolar plate (paragraph 8). Baars discloses that the core material ("metal substrate") has a high thermal conductivity, decreased volume resistance, high mechanical integrity, high chemical resistance and is electrically conductive (paragraphs 8, 37, 113). Therefore, it would have been obvious to a person of ordinary skill in the art to modify the tri-layer substrate of Hinton to include a core material ("metal substrate") because Baars' bipolar plate which includes both the tri-layer polymer composite and the metal substrate has a

high thermal conductivity, decreased volume resistance, high mechanical integrity, high chemical resistance and is electrically conductive (paragraphs 8, 37, 113).

Response to Arguments

10. Applicant's arguments with respect to claims has been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US Patent Application 2002/0001743 (Davis), US Patent 6,372,376 B1 (Fronk et al.), and US Patent 5,709,957 (Chiang et al.).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA BARROW whose telephone number is (571)270-7867. The examiner can normally be reached on 7:30am-5pm EST. Monday-Friday, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AMANDA BARROW/
Examiner, Art Unit 1795

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Supervisory Patent Examiner, Art Unit 1795